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Journal of the Society of Arts.

FRIDAY, JULY 26, 1867.

Announcements by the Council.

SOCIETY'S VISIT TO THE PARIS EXHIBITION.

Arrangements have been made for the visit of the members to the Universal Exhibition, 1867, as follows:—

The visit will extend from Monday, the 29th of July, to Friday, the 16th of August.

A Reception Room has been provided for the use of the members at No. 43, Rue Saint Georges, where members can have their letters addressed, where they can write their letters, make appointments and arrangements, and where notices of any special matters connected with the visit will be suspended. Members are requested to register their names and addresses here on their arrival in Paris. Lists of Hotels and Lodgings will be provided.

Arrangements have been made by which the Members of the Society of Arts will, through the kindness of the proprietors, be admitted, on the presentation of their cards of membership, to inspect Imperial and Municipal establishments, factories, and workshops in the following list:—

His Excellency the Minister of Public Instruction has most kindly arranged for the Members visiting the Lycées of Paris, and has also further favoured the Society with tickets to view the exhibition of the works of the pupils in the Communal schools, and of the collections made by the Scientific Commission of Mexico.

The Director of the Imperial Mint (La Monnaie) has given instructions that members of the Society, when provided with their cards, which will be prepared for the purpose, shall be admitted to that establishment on Tuesdays and Fridays, at three o'clock.

The Director of the Imperial Observatory has arranged that the Members presenting their cards of membership at that establishment shall be admitted on Saturdays, between half-past two and four o'clock.

Monsieur le Sénateur, Prefect of the Seine, has politely promised to make proper arrangements for the visits of the members to the catacombs, sewers, and municipal establishments.

Through the kindness of M. Belgrand, the water engineer to the City of Paris, permission has been obtained for members to visit the Waterworks of the City of Paris at Menilmontant, on any day to the 5th August inclusive.

The Director of the Public Ways and Promenades of the City of Paris has thrown open the horticultural and other municipal establishments in his department, and has most obligingly tendered his assistance to the members.

M. Le Play, Commissaire-General of the Universal Exhibition, has very kindly expressed his desire to aid the members in any way in his power.

The following gentlemen and companies have politely opened their establishments to the Society:—

MM. J. F. Cail and Cie., engineers, Quai de Billy, No. 48, and Grenelle. Any day of the week, from 6 to 11 a.m., and from 12 to 5.

M. F. Barbedienne has furnished tickets of admission to visit his bronze foundry and workshops, 63, Rue de Lancry, on any day in the week, from 6 a.m. to 5 p.m.

MM. Barbezat and Cie., foundries, 58, Boulevard Prince Eugene, and 95 and 97, Rue Richard-Lenoir. Open to the members without restriction as to the day or hour.

MM. Ch. Christoffe and Cie., gold and silversmiths, 56, Rue de Bondy, will receive a party of the members on any day appointed by the Society, between 12 and 2 o'clock.

MM. Hachette and Cie.'s great publishing establishment will be open to members on any day, between half-past 8 and 11 o'clock, by presenting their cards to M. Fourret, a member of the firm.

M. Ch. Lahure, Imprimerie Générale, 9, Rue de Fleurus, on any day and at any hour, except between 12 and 2 o'clock.

MM. A. Chaix and Cie., printing establishment, 20, Rue Bergère, on Friday in each week.

MM. Mazaro-Ribaillier and Cie., furniture manufacturers, Exhibition rooms, 20, Boulevard des Filles de Calvaire; manufactory, 4 and 6, Rue Ternaux Popincourt, freely open to the members.

The Directors of the Compagnie du Chemin de Fer de Paris à Orléans have given leave for the members to visit their new passenger station and goods station, on presenting their cards of membership to M. Renault, Chief Architect of the Company, No. 1, Boulevard de l'Hôpital; or to M. Prevel, 42, Quai de la Gare; according as they desire to see the passenger station or the goods station.

Mr. W. E. Newton will show the Artisans' Dwellings now being erected for H.L.M. the Emperor, in the Avenue Dumesnil. The days and hours for visiting will be notified at the Reception-rooms.

Nothing could exceed the politeness with which the various gentlemen have met the requests of the Society, and there is no doubt that in a day or two several other establishments will be added to the list.

Cards of membership, enabling members to take advantage of these arrangements, may be obtained on application to the Society's House, John-street, Adelphi, or at 43, Rue Saint Georges, Paris.

P. LE NEVE FOSTER, Secretary.

The following list of hotels will be found useful:—

IN THE NEIGHBOURHOOD OF THE TUILERIES.
Hôtel Maurice, 228, Rue de Rivoli.

" Windsor, 226, "
" Brighton, 218, "
" Wagram, 208, "
" Rivoli, 202, "
" du Louvre, 166, "

ON OR NEAR THE PRINCIPAL BOULEVARDS.
Grand Hôtel, 12, Boulevard des Capucines.

Grand Hôtel des Capucines, 37, Boulevard des Capucines.
Hôtel Scribe, 1, Rue Scribe.

" de Bade, 32, Boulevard des Italiens.
" du Tibre, 8, Rue du Helder.
" du Helder, 9, Rue du Helder, Boulevard des Italiens.
" Brezil, 16, Rue du Helder.
" de Lancastre, 22, "
" de l'Amirauté, Rue Neuve Saint Augustin.
" Choiseul, 7, Rue de Choiseul.
" des Deux Mondes, 8, Rue d'Antin.
" des Etats Unis, 16, Rue d'Antin.
" de la Grande Bretagne, 14, Rue Caumartin.

RUE ST. HONORÉ, &c.
Hôtel de Lille et d'Albion, 223, Rue St. Honoré.
" St. James, 211, Rue St. Honoré.
" Choiseul, 241, Rue St. Honoré.
" du Danube, 11, Rue Richepance.
" Richepance, 14, Rue Richepance, near the Madeleine.
" de l'Amirauté, 20, Rue Duphot.

RUE DE LA PAIX, PLACE VENDÔME, &c.
Hôtel de la Paix, 32, Rue de la Paix.
" Westminster, 11, Rue de la Paix.
" Mirabeau, 8, "
" Bristol, 5, Place Vendôme.

Hôtel du Rhin, 4, Place Vendôme.

„ Castiglione, 12, Rue Castiglione.

PALAIS ROYAL AND BOURSE.

Hôtel des Etrangers, 3, Rue Vivienne.

Grand Hôtel de France et d'Angleterre, 72, Rue Richelieu.

Hôtel d'Angleterre, 56, Rue Montmartre.

„ Bergère, 32, Rue Bergère.

Grand Hôtel de la Marine, 3, Rue des Vieux Augustins.

Grand Hôtel d'Albion, 20, Rue Bouloi.

Hôtel Bouloi, 5, Rue Bouloi.

Grand Hôtel de la Bourse, 15, Rue Nôtre Dame des Victoires.

NEIGHBOURHOOD OF THE NORTHERN RAILWAY.

Hôtel de Chemin de fer du Nord, opposite the Railway Station.

Grand Hôtel du Nord, 45, Rue Lafayette.

Grand Hôtel de Strasbourg, 78, Boulevard de Strasbourg.

Hôtel Violet, Passage Violet, Faubourg Poissonnière.

BETWEEN THE WESTERN RAILWAY STATION AND THE MADELEINE.

Hôtel des Etrangers, 24, Rue Tronchet.

„ Tronchet, 22, „

„ Folkestone, 9, Rue Castellane.

„ Bedford, 17, Rue de l'Arcade.

„ de l'Arcade, 43, Rue de l'Arcade.

„ Navarin, Rue Navarin.

SOUTH SIDE OF THE SEINE.

Hôtel d'Amsterdam, 59, Rue Saint André des Arts.

„ des Beaux Arts, 1, Rue Beaux Arts.

„ Bretagne, 20, Rue de Seine.

„ „ 46, St. André des Arts.

„ de Breteuil, 1, Rue Dauphin.

„ Clovis, 69, Rue Monsieur le Prince.

„ Suffren, Avenue Suffren, Champ de Mars.

RAILWAYS AND STEAMBOATS.—The terminus of the Auteuil and Exhibition Railway is at the Western Station, Place du Havre. 2nd class carriages only 50c., intermediate stations 40c. Trains leave the terminus at 27 minutes, and the Exhibition at 25 minutes past each hour; there is an extra up train at 5-57. The Circular Railway (Chemin de fer de Ceinture) has stations all round Paris, and joins the preceding at Auteuil. The large omnibuses of the American Railway run from the Bourse, and carry passengers for the Exhibition to the Pont d'Alma. Steamboats run from the Place de la Concorde every quarter of an hour for the Exhibition. Landing stage on the Paris side of the Pont de Jena. Other steamboats ply between the Champ de Mars and the Ile de Billancourt. Landing stage on the lower side of same bridge.

NUMBERS OF HOUSES IN STREETS.—Even Nos. on right side, odd Nos. on left side of street, progressing in direction of the stream of the river, or commencing from the river in transverse streets.

POSTE RESTANTE.—Letters addressed “Poste Restante” to be applied for at the head post-office, 9, Rue Jean-Jacques Rousseau; but members can have their letters addressed to No. 43, Rue St. Georges.

CAB FARES IN PARIS.—Two kinds of cabs—single seat for two; double seat for four.

Fare either by the “hour” or the “course,” at the option of the hirer (“course” any distance without stoppage).

Fares—Two-place cab, 2f. per hour; 1-50f. per course; four-place cab, 2-25f. per hour; 1-70f. per course.

Driver's usual gratuity, 5 sous per hour; 3 or 4 sous per course.

Extra charge between 12-30 night and 6 morning.

„ „ when taken from “Remise” (coach-house).

„ „ beyond the fortifications.

„ „ for luggage.

Ticket containing full particulars of authorised charges always to be given by the driver on entering his cab.

OMNIBUS FARES.—30 centimes (3d.), inside; 15 centimes (1½d.), outside.

MONEY.—Gold:—20 francs, 10 francs, and 5 francs. Silver:—2 francs, 1 franc, ½ franc, and 20 centimes. Copper:—10 centimes (2 sous) = 1d.; 5 centimes (1 sou) = ½d. £1 = 25 francs, usual exchange.

ARTIZANS' VISIT TO PARIS.

Her Majesty's Government have granted to the Society of Arts, in aid of the fund now being raised by the Society for assisting workmen, specially selected from various trades, to visit and report on the Paris Exhibition, the sum of £500, conditional on the Society raising a like amount by public subscription.

The following is the list of subscriptions up to the present date:—

H.R.H. THE PRINCE OF WALES, President ..	£31	10	0
HER MAJESTY'S GOVERNMENT (conditional) ..	500	0	0
Society of Arts	105	0	0
Earl Granville, K.G.	5	0	0
Lord de L'Isle	10	0	0
Thomas Twining	2	2	0
Sir J. P. Boileau, Bart.	5	0	0
George Godwin, F.R.S.	1	1	0
Vice-Chancellor Sir W. Page Wood, F.R.S. ..	10	0	0
W. H. Bodkin (Assistant-Judge)	3	3	0
Sir Rowland Hill, K.C.B.	3	3	0
Benjamin Shaw	2	2	0
Alfred Davis	10	10	0
Eugène Rimmel	5	5	0
Frederick Mocatta	2	2	0
James Marshall	2	2	0
Robert Dawbarn	1	0	0
Henry Vaughan	10	10	0
Philip Sancton	5	0	0
Somerset A. Beaumont	5	0	0
Decimus Burton, F.R.S.	1	0	0
W. Botly	1	1	0
Professor Robert Bentley	2	2	0
John Stuart Mill, M.P.	1	1	0
G. F. Wilson, F.R.S.	2	2	0
Henry Creed	1	1	0
The Marquis of Salisbury, K.G.	10	0	0
D. Robertson Blaine	2	2	0
William Hawes	2	2	0
Seymour Teulon	1	1	0
G. N. Hooper	2	2	0
Lord Taunton	5	0	0
Henry Cole, C.B.	1	0	0
A. Robb	1	1	0
S. Andrews	1	1	0
Thomas Dixon	1	1	0
Charles Telford	1	1	0
Edmund Burke	2	0	0
W. H. Gore Langton, M.P.	5	0	0
J. R. Fowler	1	0	0
John Rutson	1	1	0
W. Fothergill Cooke	2	2	0
J. P. Gassiot, F.R.S.	5	5	0
The Duke of Devonshire	10	0	0
Messrs. Chawner and Co.	2	2	0
Chas. Brooke, F.R.S.	1	1	0
T. Chappell	2	2	0
C. Candy	2	0	0
Alfred Haines	2	2	0
Major-General Sir William Gordon, K.C.B. ..	2	2	0
Bartlett Hooper	2	2	0
F. Richardson	1	1	0
J. Sharples	3	3	0
Henry Johnson	2	2	0
C. Skipper, jun.	1	1	0
G. T. Saul	1	1	0

Carry forward £803 15 0

Brought forward	803	15	0
Alderman D. H. Stone	5	5	0
G. H. Walker	1	1	0
R. Worthington	2	2	0
A. W. Miles	2	2	0
J. Harris Heal	2	2	0
John Bell	1	0	0
Messrs. Mander and Co.	2	2	0
B. S. Cohen	1	1	0
John Corbett	1	1	0
J. Zaehnsdorf	0	10	6
Major-General Viscount Templetown, C.B.	5	0	0
J. Pearce	3	3	0
Messrs. Huntley and Palmer	2	2	0
A. Glendining, jun.	1	1	0
A. Trevelyan	2	2	0
S. Harrington	1	1	0
Montague Ainslie	2	2	0
James Bentley	2	2	0
Capt. R. P. Oldershaw	1	0	0
E. C. Tufnell	2	2	0
Samuel Redgrave	1	1	0
Joseph Lockett	2	2	0
Messrs. Spicer, Bros.	4	4	0
John Tolhurst	1	1	0
Lord Ebury	5	0	0
C. Lawson	1	0	0
John Horton	1	1	0
W. Baker	1	1	0
Henry Briggs	1	1	0
James Heather	1	1	0
H. Reader Lack	1	1	0
C. Silvy	1	1	0

*Collected in response to a Circular issued by the
Birmingham Chamber of Commerce.*

G. Dixon, M.P., Birmingham	5	5	0
Messrs. Smith and Wright, Birmingham	5	5	0
Messrs. Griffiths and Browett, Birmingham	5	5	0
Henry Weiss, Birmingham	2	2	0
W. H. M. Blews, Birmingham	2	2	0
W. Middlemore, J.P., Birmingham	5	5	0
Thomas Lloyd, Birmingham	2	2	0
Messrs. Elkington and Mason, Birmingham	5	5	0
Messrs. John Hardman and Co., Birmingham	2	2	0
Messrs. F. and C. Osler, Birmingham	5	5	0
The Proprietors of the <i>Birmingham Journal and Daily Post</i>	2	2	0
The Proprietors of the <i>Birmingham Gazette</i>	2	2	0
R. L. Chance, Birmingham	2	2	0
T. Avery, Birmingham	2	2	0
W. Tonks and Sons, Birmingham	2	2	0
W. Lucas Sargant, Birmingham	2	2	0
— Mountain (Messrs. Walter, May, and Co.), Birmingham	2	2	0
J. A. Williams, Birmingham	2	2	0
Henry Charlton, Birmingham	2	2	0
W. Bartlett and Sons, Birmingham	5	0	0
John P. Turner, Birmingham	0	10	6
W. H. Avery, Birmingham	2	2	0
Messrs. Peyton and Peyton, Birmingham	3	3	0
James Cartland, Birmingham	2	2	0
Messrs. Smith and Chamberlain, Birmingham	2	2	0
Messrs. Baker and Son, Birmingham	2	2	0
Messrs. Hinks and Wells, Birmingham	2	2	0
Messrs. Van Wart and Co., Birmingham	5	0	0
Messrs. Evans and Askin, Birmingham	2	2	0
C. Shaw, Birmingham	2	2	0
James Barwell, Birmingham	1	1	0

Total £952 15 0

Messrs. J. M. Johnson and Sons have kindly placed at the disposal of the Council a number of their five-shilling English Catalogues of the Exhibition, sufficient to present each workman with a copy.

Subscriptions may be forwarded to the Financial Officer, at the Society's House.

The Council are now prepared to receive the names of any workmen recommended by their respective trades as fit and proper persons to undertake this important duty on behalf of their fellow workmen.

Proceedings of the Society.

FOOD COMMITTEE.

PRESERVATION OF MEAT.

Messrs. Medlock and Bailey have put forth a plan for the preservation of meat, poultry, and fish. It appears, from a printed document issued by those gentlemen, that—

"Something like two hundred patents have been taken out in this country for the 'Preservation of Food,' many of them, indeed, within the last few years; but, as is very well known, with the exception of some specially intended for preserving fruit and vegetables, there has hitherto been no really efficient and reliable process by which the decomposition or decay of food products in general could be prevented. It is true that, taking the subject as a whole, numerous and important improvements have been made; in the manufacture of ice and refrigerating machines; in the modes of pickling or salting meat; in the compressing and sealing in tins of various preparations, &c., &c.; but all these contrivances, even when most successfully carried out, present some objections which are fatal to their general use; they are either injurious to the flavour or destructive to the nutritive value of the substances intended to be preserved; the processes themselves are too complicated in their action or too uncertain in the results obtained; or, lastly, the cost of the preserved substance is such that it is useful only in an auxiliary sense, and is utterly inapplicable to the every-day requirements of the people at large.

* * * * *

"By a few minutes' labour, and at a trifling outlay, anything of animal origin—from a beefsteak to a bullock; from a whitebait to a whale—can now be preserved sweet, wholesome, and uncontaminated, for days, weeks, or months, if necessary, wholly irrespective of country, climate, or time of year.

* * * * *

"In the first place, it will be as well to consider for a moment the chief causes of failure hitherto in the preservation of meat, fish, poultry, &c., speaking, of course, in a practical and commercial—not a scientific point of view—as it is well known that many operations can be successfully performed in the chemist's laboratory which are far too difficult and expensive to be carried out upon a large scale. We may dismiss the preservation of food products by means of ice or freezing mixtures in a word, as they are evidently capable of very limited application. Some of our large butchers, fishmongers, &c., keep their goods in ice cellars during the hottest seasons; but this practice is quite exceptional, and probably not one per cent. of the dealers in such perishable articles have the means of keeping them moderately cool in summer. Even in these instances the advantages to the public are considerably modified by the fact that frozen animal food, when exposed to a warm temperature, will putrify with very great rapidity. According to Dr. Cattell, animal food, and more especially fish, is always rendered less nutritious by the freezing process, and is the cause of much ill-health.

"Of the other methods of preserving animal food that call for a passing notice, the salting or curing plan must of necessity rank foremost, as it has been in use for centuries, and, to a moderate extent, is convenient,

popular, and beneficial. Salt, however, is powerless to preserve meat effectually in any but the coldest weather, unless so large a quantity is employed that substances thus treated are both unpleasant to the palate and dangerous to the health.

* * * * *

"Suffice it that in excess salt is very injurious, and that, innocent as it is popularly believed to be, more than one case of 'poisoning' by its use has been recorded by Dr. Christison and others. Another and a grave disadvantage attending the use of more salt is, that meat loses from one-quarter to nearly half of its nutritive value in the usual salting processes, and is almost entirely robbed of those mineral constituents, more particularly potash, the want of which induces scurvy and other diseases.*

"Of the dried, powdered, compressed, or extracted meats we need say but little; their applications are so extremely limited that it is out of the question to consider them in relation to the broad subject of food for the people. For travellers, invalids, children, &c., they are frequently of service in the absence of more rational food, but their cost is always treble or quadruple that of the more common but practically wholesome beef and mutton.

"Lastly, we must notice the meats put up in hermetically-sealed tin canisters, either with or without the addition of salt, spices, or antiseptics. It cannot be denied that these preparations have proved of great utility to our soldiers, sailors, and explorers, as a change from the 'odious salt meats,' and that they have exercised a marked influence upon the health, comfort, and general physique of these classes of our countrymen during the last twenty years; but we have still to reiterate the same fatal drawbacks to their general use, namely, uncertainty,† want of flavour and nutrition, costliness, and, in many cases, a very unpleasant metallic taste derived from the containing vessel. Besides these special disadvantages, which vary with each particular process, there is another and a serious one, common to all the preserved meats of this class:—They are, without exception, prepared at a temperature considerably above the boiling point of water, and are, consequently, much over-cooked in the first instance.

"Similar objections, in a greater or less degree, apply also to those preparations which are merely coated with a thin film of some substance, which is air and water proof, such as wax, paraffin, collodion, gutta-percha, &c.; while, if the protecting envelope of these last is broken or punctured at any one point, however small, decomposition sets in immediately."

* * * * *

Messrs. Medlock and Bailey go on to say their "process for the preservation of animal substances possesses manifold advantages over all others hitherto proposed, but more especially those of economy and simplicity of application. By its means the meat, poultry, game, fish, &c., of a large household, or wholesale establishment, can be effectively preserved for months in any weather, at a nominal expenditure of time and money; no soldered tin cases are required; no complex apparatus is necessary; no want of flavour or nutritive power is the result; and, finally, whether the edibles thus treated are eaten in two days' or two months' time, nobody, save the actual manipulator, need know anything about it.

* * * * *

"In the case, say of a small family who wish to keep a leg of mutton, or a sirloin of beef, for a week in sultry thundery weather, with the thermometer at 90 deg., take

a teacupful of 'Medlock and Bailey's Patent Bisulphite of Lime Solution,' a dessert spoonful of common salt, and about a quart of cold water, mixing the same in an earthen pan, basin, or other suitable vessel. Dip the meat in this mixture for a few minutes, taking care with the end of a cloth to wet it all over, then hang the joint up as usual. A dip, night and morning, will ensure its keeping sweet and fresh for any length of time. If the weather is unusually hot, a cloth soaked in the same solution may be wrapped round it with advantage.

* * * * *

"Game or poultry may be treated in precisely the same manner, having been first plucked and drawn. Fish, too, should be previously gutted. Eggs may be retained in the fresh or 'new laid' condition, simply by being completely covered over with bran soaked with the same liquid mixture; while bacon can be prevented from getting 'rusty' by this simple plan. If the joints are large and numerous the proportions should be thus:—

Bisulphite of lime		2 quarts.
Common salt		1 pint.
Water		4 gallons.

"When the meat, &c., is required for cooking, all that is necessary is to lay it in cold water for a few minutes, and afterwards to dry it thoroughly in a cloth; on a close inspection no odour or other alteration whatever will be apparent—the lean will not be reddened, nor the fat changed to the deep yellow tint so often apparent with 'hung' meat, and the texture will be, as at first, firm and consistent. Nay, more, if, not content with the evidence of our ordinary senses, we place a portion under the microscope, we shall observe that the general structure of the tissues has not suffered in the slightest degree; and if we went further, and delivered the whole to an analyst, his report would be that the various nutritious principles were present as usual, and had not sustained the slightest injury.

"With the view of testing the effects of this new preservative in tropical climates, some beef, mutton, fowl, salmon, lobsters, &c. were treated by Medlock and Bailey's patent process, and exposed in a chamber, specially arranged for the purpose, to a temperature varying from 80 deg. to 110 deg. Fahr. Portions of the same joints, fowls, &c., not prepared in any way, began to emit an unpleasant odour in about 16 hours, and were absolutely putrid in 12 more, while those treated with the preservative mixture showed no sign of decay whatever during the whole period of twelve days; from the very high temperature to which they were subjected, a little oily matter separated from the fish, but the original odour and flavour remained unimpaired to the end of the time, even the lobsters being pronounced 'delicious, evidently just boiled,' by those who partook of the same. The eggs which had not been treated with the bisulphite, &c., all, more or less, decomposed under the influence of the heat, while the others remained 'new-laid' throughout. In a word, these experiments, intended to test, in the most severe manner, animal food treated with bisulphite of lime, at a tropical temperature, simply afforded still further evidence of its practical use.

"At the time at which we write, some three months since the trials we have just recorded, all the meats, fowls, &c., remaining uneaten are perfectly good and sweet, although exposed to the ordinary changes of temperature, &c., in a rather warm room."

* Dr. Marcet's plan of enclosing the meat in bladder, or some similar material, before immersing it in the brine, by no means obviates these objections, although, to a certain extent, an improvement upon the old method.

† By "uncertainty" we mean that when once a tin of "preserved meat" is soldered down, no person can tell what it is, or in what condition it may be. Many of these tins are wrongly labelled, and our readers will remember that in 1851 (out of one particular batch only), of 6,000 tins of preserved meat supplied under contract to Government, and opened, more than 5,000 contained putrid meat and offal!

Proceedings of Institutions.

EXAMINATION PAPERS, 1867.

The following are the Examination papers set in the various subjects at the Final Examination held in April last:—

(Continued from page 549.)

GEOMETRY.

THREE HOURS ALLOWED.

1. If one side of a triangle be produced, the exterior angle is greater than either of the interior opposite angles.

2. The three interior angles of any triangle are together equal to two right angles. Show how this may be proved experimentally as well as by reasoning.

3. In any right-angled triangle the square described upon the side subtending the right-angle is equal to the squares described upon the sides containing the right-angle.

4. Divide a given right line into two parts, so that the rectangle contained by the whole and one of the parts shall be equal to the square of the other part. What is the numerical ratio of the part so found to the whole line?

5. Equal straight lines in a circle are equally distant from the centre.

6. The opposite angles of any quadrilateral figure inscribed in a circle are together equal to two right-angles.

7. Upon a given straight line describe a segment of a circle which shall contain an angle equal to a given rectilineal angle.

8. Inscribe a regular hexagon in a given circle.

9. In a right-angled triangle, if a perpendicular be drawn from the right-angle to the base, the triangles on each side of it are similar to the whole and to one another. Prove this. Hence show how to find a mean proportional between two lines.

10. In equal circles, angles at the centre have the same ratio to one another which the circumferences on which they stand have to one another.

11. If two straight lines are at right-angles to the same plane, they shall be parallel to one another.

12. If straight lines be cut by parallel planes, they shall be cut in the same ratio.

PROBLEMS.

1. If the sides of a quadrilateral be bisected, and the points of bisection be joined, the included figure is a parallelogram, and its area is half the area of the original figure.

2. Place a straight line in a circle which shall be commensurable with the diameter.

3. If two sides of a quadrilateral described about a circle be parallel, each of the other sides will subtend a right-angle at the centre of the circle.

4. If on the sides of a quadrant semi-circles be described, the part which is common to both semi-circles is equal to the part of the quadrant which is exterior to both.

5. If a straight line be drawn cutting any number of concentric circles, show that the segments it cuts off cannot be similar.

6. Through a given point draw a circle touching a given circle, and also another circle passing through the given point.

7. There cannot be more than two similar triangles inscribed in the same segment of a circle.

8. In an isosceles triangle inscribe three circles, each of which shall touch the other two and also two adjacent sides of the triangle.

9. How can a line be drawn perpendicular to two lines which are not in the same plane?

10. Two points are taken on two walls which meet at right-angles, or at any angle, what will determine the position of the shortest line from one point to the other?

MENSURATION.

THREE HOURS ALLOWED.

1. Find the area of the rectangle which is 14ft. 6½in. long and 4ft. 3in. broad; and the length of the rectangle which contains 172ft. 18in. and is 6ft. 9in. broad.

2. A wooden partition is 69ft. 11in. long and 42ft. 7in. high: what will it cost at £6 15s. per square?

3. Find the number of gallons contained in a cistern 6ft. 8in. long, 3ft. wide, and 2ft. 6in. deep. Find also the cost of lining it with sheet lead of 10lbs. to the foot at £2 2s. per cwt.

4. Find the area of a piece of land from the following notes:—

	186	
	130	64
56	72	32
	28	18
50	0	

5. The diagonals of a quadrilateral intersect one another at an angle of 30°, the perpendiculars upon them from the four angles are 1, 2, 3, 4: show that the area of the quadrilateral will be either 21 or 24 or 25.

6. Two rectangles each six inches long and an inch broad are laid across one another so that the part in contact is half the area of one of the rectangles: show how this may be done.

7. A regular triangle, square and hexagon, have their perimeters of the same length, compare their areas; and, if their areas be equal, compare their perimeters.

8. A number of concentric circles are described with radii of 1, 2, 3, &c., inches forming circular rings: find which of two consecutive rings are to one another as 15 to 17. Also find two rings which are to one another as 1 to 3.

9. Find the radius of a segment-arch, having given the span and the rise.

10. A right-angled triangle, whose sides are 6, 8, and 10 inches, is made to turn round its greatest side, thus describing two right cones: find the volume contained within them.

11. A right pyramid has for its base an equilateral triangle whose sides are 10 inches long, and the area of its three sides is twice that of the base: find the height the pyramid, and the length of one of its edges.

12. A conical vessel is half filled with fluid, and when half as much more is poured in the surface rises an inch find how far the surface is then below the top of the vessel.

13. A sphere of silver (specific gravity 10·5) of 10in. in diameter is covered with a coating of gold (specific gravity 19·25) $\frac{1}{100}$ th of an inch thick: compare the volumes and weights of the two metals, and find the weight of the silver.

TRIGONOMETRY.

THREE HOURS ALLOWED.

1. Find the number of grades in the angle of a regular octagon.

2. Find the sine and cosine of 15° and 18°.

$$\text{If } \tan. (9a + 3b) = 2 + \sqrt{3}$$

$$\text{and } \tan. (7a - 2b) = 2 - \sqrt{3} \text{ find } a \text{ and } b.$$

3. Express $\sin. (A + B)$ in terms of the sines and cosines of A and B, where A and B are each less than 90°; first, when $A + B < 90^\circ$, and secondly, when $A + B > 90^\circ$.

4. What is the logarithm of ·0625 to a base 8?

5. In a triangle, $a = 133$; $b = 7$; $A - B = 90^\circ$, find C; when $\log. 3 = \cdot 4771219$;

L. $\tan. 41^\circ 59' = 9\cdot 9541834$; L. $\tan. 42^\circ = 9\cdot 9544374$.

6. If $\pi = 17a$, find the value of $\frac{\cos. a}{\cos. 3a + \cos. 5a}$ and show that

$$\sin. {}^2(a+b) = \sin. {}^2a + \sin. {}^2b + 2 \sin. a. \sin. b. \cos. (a+b).$$

7. A B C D is a square, and O a point within it; having given the distances of O from A, B, and C, find the length of the side of the square.

8. Find the radius of the circle which touches one side of a triangle and the other two sides produced. If the centres of the three circles so described be joined, prove that the area of the triangle thus formed $= \frac{abc}{2r}$

a, b, c , being the sides of the Δ and r the radius of the inscribed circle.

9 Prove in a triangle ABC , that—

$$c = a \cos. B + b \cos. A.$$

and thence obtain the $\cos. C$ in terms of the sides.

10. Show that

$$(1.) 4 \cos. \frac{1}{2} A \sin. \frac{1}{2} A + 4 \sin. \frac{1}{2} A \cos. \frac{1}{2} A = 3 \sin. A.$$

$$(2.) \text{ If } \cos. \theta = \frac{\cos. \rho - c}{1 - c \cos. \rho} \text{ then } \tan. \frac{\theta}{2} = \sqrt{\frac{1+c}{1-c}} \tan. \frac{\rho}{2}$$

11. The upper half of a column of given height, seen from a point on a level with the base of the column, subtends an $\angle = \tan. \frac{1}{3}$, find the distance of the point of observation, and the elevation of the column.

12. $ABCD$ is a parallelogram, AC and BD the diagonals, given $AB, \angle CAD$ and $\angle DBC$, find the area of the parallelogram.

13. Show that,

$$\tan. n \theta = \frac{\sin. \theta + \sin. 3\theta + \sin. 5\theta + \dots \text{ to } n \text{ terms.}}{\cos. \theta + \cos. 3\theta + \cos. 5\theta + \dots \text{ to } n \text{ terms.}}$$

14. Find the cosine of the angle of a spherical triangle in the terms of the cosines and sines of the sides.

15. Deduce from the above result the values of $\sin. \frac{A}{2}$ and $\tan. \frac{a}{2}$

16. State Napier's rules, and if c be the middle part and C the right angle, prove that case of the rules.

17. Solve the oblique-angled triangle C, a, b being given.

CONIC SECTIONS.

THREE HOURS ALLOWED.

SECTION I.—GEOMETRICAL CONICS.

1. Define a cone, and show that, if it is cut by a plane parallel to one of its slant sides, the ordinate of the curve formed by the section varies as the square root of the abscissa. What is the co-efficient of variation?

2. In the parabola prove that (1) the tangent bisects the angle between the focal distance and a line parallel to the principal axis, (2) the sub-tangent is equal to twice the abscissa.

3. Prove that tangents drawn at the extremities of a focal chord of a conic intersect in the directrix, and show that in a parabola they intersect at right angles.

4. Define an ellipse in reference to a focus and a directrix, and prove that the sum of the focal distances of any point in the curve is equal to the major axis.

5. What is the auxiliary circle? Prove that perpendiculars drawn from the foci on a tangent intersect the tangent in the auxiliary circle.

6. Prove that the area of a parallelogram circumscribed about an ellipse and having its sides parallel to conjugate axes is constant.

7. Deduce the preceding proposition from a property of the circle by projection.

8. Draw tangents to a hyperbola from a given point without it.

9. If the normal at any point P of a hyperbola meets the transverse axis in G , then $SG : SP :: CS : CA$.

10. Define an asymptote to a hyperbola, and, given the centre and length of the axes, construct the asymptotes.

SECTION II.—ANALYTICAL CONICS.

11. Investigate the equation to a straight line, and find the co-ordinates of the point of intersection of two given straight lines.

12. Find the length of the perpendicular from the origin on the line passing through the two points (x', y') and (x'', y'') .

13. What is the equation to the circle, radius $= c$, referred to two tangents perpendicular to each other as co-ordinate axes? Also what is the equation to the normal which passes through the origin?

14. Find the equation to the normal of a parabola, and determine the point at which the normal at the extremity of the latus rectum again meets the curve.

15. Prove analytically the theorems contained in 2, 3, 5, 6, 9 of the preceding section.

16. If the base and ratio of the sides of a triangle are given, prove that the locus of the vertex is a circle. What are harmonic conjugates?

17. Show that the equation to a hyperbola may be put into the form $xy = k^2$; give a geometrical interpretation of the equation.

(To be continued.)

PARIS EXHIBITION.

The hall of conference, or lecture-room, in the park of the Exhibition, has not had the success expected by its promoters, and the Imperial Commission has decided that gratuitous lectures or conferences shall in future be given either in the galleries of the Exhibition itself, or in the buildings without, in the locality of the objects to which they refer. The new series has just commenced, and the following is a portion of the programme:—

Tuesdays, from 10 to 11 o'clock, in the French machine gallery, M. Thomas, engineer:—1. On the manufacture of caoutchouc, illustrated by apparatus exhibited by MM. Guibal, Aubert, Gérard and Co. 2. On apparatus for washing in vacuo, exhibited by M. Berjot.

Thursdays, 8 to 10 a.m., in the park, Allée du Forez, M. Rouart, civil engineer, on the manufacture of ice, and the square machine exhibited by Messrs. Mignon and Bouart.

Fridays, 1 to 3 p.m., park, Allée de Bretagne, M. Thomas, on candle making.

Tuesdays and Fridays, 8 to 11 a.m., in the chemical laboratory established by the side of the river, near the Pont de Jena, M. Wiesnegg, exhibitor, on heating apparatus for laboratories. Experiments in the fusion of iron by Schlæssing's process; experiments in the fusion of copper by Perrot's process.

Thursday and Saturday, 8 to 11 a.m., same locality, M. Giroux, on the regulation of gas, and experiments on the regulation and illuminating power.

Tuesday and Friday, 2 to 5 p.m., same place, M. Swarzweber, conferences and experiments on the industrial production of oxygen, Tessié du Motay and Maréchal's process.

Wednesday, 2 to 4 p.m., same place, Baron de Plazanet, experiments in galvano-plastics.

Tuesdays, from 2 to 5 p.m., and Fridays, from 9 to 11 a.m., same place, M. Pontier, exhibitor, on distilling apparatus for laboratories and private houses.

M. Ferdinand de Lesseps will also explain the works of the canal of the Isthmus of Suez, the various difficulties that have been surmounted, and the actual state of the works, on Tuesdays, the 23rd and 30th of July, and 6th August, at 10 a.m. These conferences will be held in the circular building in the park, before the panorama of the Isthmus.

MAURITIUS AND NATAL, AS SUGAR PRODUCING COUNTRIES, COMPARED.

The *Natal Mercury*, of a recent date, makes the following remarks on the above subject:—"At a time when we are anxiously looking out for any stray gleams of hopefulness that may shoot athwart the gloom of commercial depression, the interest which Mauritians are at last beginning to take in our colony is exceedingly cheering. Until now our neighbours in the Isle of France have rather despised and pooch-pooched us. They have ignored our sugar producing capabilities; affected disbelief in the success of sugar manufacture here; and regarded us as an obscure, insignificant little colony, which was attempting work far beyond its capacities. Not that

there has been rudeness in the way we have been treated by the Mauritians. They have always heard what we had to say, and whenever Natalians have visited them there has been no backwardness in giving information, in offering advice, and in dispensing unbounded hospitality. But they have fondly clung to the conviction that a country subject to visitations of frost, and so far removed from the tropics, could not grow sugar cane profitably during successive years. Latterly this delusion has been wearing off. Year after year sugar cane has been grown, and sugar made in an increasing ratio. A considerable export has been made. Mauritius brokers have read "Natal" quoted at fair rates alongside their own. Visitors from the island have personally inspected the colony, and returned with favourable reports of its natural features and capabilities. And now that misfortunes have befallen them, and the prospects of enterprise in their own sphere are clouded and contracted, the good people of Mauritius incline to look more curiously upon a colony where congenial pursuits are followed, where there is boundless scope for expansion, and which is more accessible to them than any other.

"It is clear that many years' experience of various drawbacks have made the Mauritians anxious about their future. The borer, disease, drought, and hurricanes, have at last reduced their cup to half what it once was. Labour is costly there; food is dear; the climate is precarious; above all, the area of available land is limited—is, in fact, pre-occupied. We by no means think that Mauritius is in such a bad case that recovery is hopeless. A few years may find her more prosperous than ever. But meanwhile, the circumstances of the colony are such, that we don't wonder its residents are casting their eyes abroad in search of "fresh fields and pastures new," where their sons may plant themselves and their fortunes afresh.

"The advent of a number of young Mauritius planters, armed with means enough—in the shape of credit or capital—to buy up old estates, or start new ones, would, we believe, be an undoubted boon. They would afford a market for the sale of embarrassed estates, where want of capital has made it impossible for the proprietors to carry on. They would transplant here the systems and the experience of the most successful sugar producing field in the world. They would place sugar planting on a new basis, and identify with our interests the large monetary and other institutions which offer to planters in Mauritius facilities little known here. If we wish to introduce sugar planters, then, a better class of men cannot be desired than these would be.

"Nor do we think that Mauritians will be disappointed in their experience here. They will find land and labour both plentiful and cheap; a climate far healthier, less oppressive, and more equable than their own; a virgin soil, which, even on the oldest plantations, has not yet been enriched by manure, except on a partial scale; and provisions moderately cheap. That they will also find much, in connexion with sugar planting, that they dissent from and disapprove of, is highly probable. Every Mauritian who has come here has said that radical improvements were necessary. It will be for them to give force and value to their objections, by showing that they can do better. When they do that, we have no doubt that Natal planters will but too gladly follow in their wake, and profit by their examples.

"Had we here such a government as one finds in some other places, and a local immigration department established, able to cope with any emergency that may arise, this important tendency on the part of Mauritius planters would be fostered and guided by the powers that be. The Mauritians seem to us to desire authoritative information, and they would attach more weight to representations proceeding from Government than from any other quarter. There would be no impropriety in governmental action on such a subject. The matter is one of vital consequence, and might affect most

materially the welfare of the country. Had we such a department as the Legislative Council has often proposed should be established, instead of a feeble Board, which can show no practical results of its long but weakly existence, it would naturally and properly fall within its province to communicate to the Government of Mauritius such data as might be required by persons there, in coming to a decision upon the expediency of migration. There would be no impropriety in such a course of action—nothing that would be foreign to the functions of an enlightened Government. But our executive seems in dire want of some powerful stimulant to effort. It has done nought so far to restore us. Its intentions, we believe, are good, but its works are inappreciable, while its action has been partially paralysed by the inconclusive policy of the legislature. When the colony needs more than ever strong guidance and help, it is most helpless. But Heaven helps those that help themselves; and despite the shortcomings of its rulers, we trust that the self-reliant energies of the colonists, individually, will enable them, unaided, to retrieve their misfortunes, and to gain their ends. In any case, should any Mauritians come here on a 'prospecting' mission, or with actual views of settlement, we can promise them, on the part of the colonists, a cordial welcome, and all the facilities that we have it in our power to offer."

Fine Arts.

ENGLISH AMATEURS OF ART IN FRANCE.—Only a short time since, Bordeaux lost the best friend of artists, and one of the most enlightened connoisseurs and friends of art, in Mr. Scott, late British consul at Bordeaux. Marseilles has just suffered a similar loss by the death of Mr. Robert Gower, of that city. Mr. Gower had one of the finest collections of works of art in the south of France; his private residence, called the Château de Repentance, at Aix, was a perfect museum of paintings, sculpture, antiquities, porcelain, and faïences of a very high class.

THE BRITISH INSTITUTION.—A correspondent of the *Standard*, after expressing his great regret at the contemplated dissolution of this establishment, which for "more than half a century has been of the greatest service to art and its highest development in the sister studies of painting and sculpture," gives the following particulars:—"On referring to a carefully-compiled hand-book, entitled 'Recollections of the British Institution,' by Thomas Smith, published in 1860, we find that, since the foundation of the institution to the year 1859, no less a number of original paintings by British artists than 23,150 have been exhibited in the gallery, and that the sales arising from such exhibitions, without any expense to the artists, have amounted to more than £150,000; and, on looking through the catalogues of these various exhibitions, many then comparatively unknown names occur in the early ones which in later days became famous and celebrated all over the world. Amongst them may be mentioned Beechey, Bourgeois, Callcott, Copley (father of Lord Lyndhurst), Daniel, Fuseli, Howard, Lawrence (a future president of the Royal Academy), Northcote, Opie, Reinagle, Smirke, Stothard, Bird, Turner, Ward, Benjamin West (another president of the Royal Academy), Westall, Shee and Eastlake (two other future presidents of the Royal Academy), Linnell, Haydon, Wilkie, Collins, Etty, Constable, Hilton, Martin, Jones, Hayter, Landseer, Briggs, Mulready, Ross, Stark, Jackson, Stanfield, Danby, Leslie, Uwins, Roberts, Herbert, Pickersgill, &c. In donations to artists and complimentary premiums, by way of encouragement to the young and meritorious, the institution has given some £15,000; and in the purchase of pictures and sculpture, which in most instances have been given to the nation—as may be seen by a visit to

Greenwich and Chelsea Hospitals, the National Gallery, and many of the metropolitan churches—some £13,000 in addition.”

CERAMIC MUSEUM, LIMOGES.—A large number of specimens of modern china and earthenware in the Paris Exhibition have been purchased for or presented to the Museum of Limoges. This establishment was heretofore scarcely known in Paris, and it is now brought prominently before the world by the perseverance of the director of the museum, M. Adrien Dubouché, who made an appeal for subscriptions in the Limoges journals, and in a few weeks obtained 9,000 francs; he then visited the Exhibition, made some purchases, and the potters were so well pleased with the idea of seeing specimens of their productions placed in a museum, that they presented more than 20,000 francs' worth for that purpose to M. Dubouché, who is collecting more subscriptions to purchase specimens of the pottery of foreign countries. Messrs. Minton, Copeland, Wedgwood and other English firms, whose table services, enamelled and brown stoneware are in great request here, have all contributed towards the collection of the museum. M. Dubouché's next object is to obtain specimens of Spanish pottery, of the curious red and blue ware of Morocco and Algeria, of the Japanese porcelain, and the decorative tiles of Egypt and Persia. The idea of a museum of modern ceramic is a good one, and it is very appropriately situated in a town whose productions of a kindred kind are held in such high esteem. The Berlin Museum is also purchasing and collecting largely in the same field.

Manufactures.

LONDON GAS.—The course of six lectures on coal gas, recently delivered by Professor Frankland at the Royal Institution, concludes with the following protest against the bad quality of London gas:—“What, then, is our position in this great and wealthy city with regard to the supply of gas—in this the metropolis of the country, which annually yields such vast quantities of the finest gas-coals in the world, and sends these coals half round the earth to illuminate the cities of other nations? An inspection of the table I have just referred to fails to convince me that we are fairly and considerately treated in this respect. Perhaps as consumers we are rather partial in the matter; but still we are entitled to be heard from our point of view. To obtain the light with which the inhabitant of Edinburgh or Glasgow illuminates his drawing-room, we have to burn double the amount of gas, and to have the atmosphere of our drawing-room contaminated with double the heat and moisture, and many times the amount of sulphurous acid. Some sixteen years ago I examined analytically and photometrically the gas supply of the metropolis, and I have no hesitation in saying that it was better then than now. How is this to be accounted for? Has invention, which has been so busy in improving other manufactures, left that of gas untouched? By no means. Improved retorts, exhausters, and purifying processes have been brought forward in abundance. Have, then, the gas companies disregarded these improvements? By no means. Whenever the improvement promised to reduce the cost of the manufacture of gas, they have eagerly adopted it. Thus, within the time I have just mentioned, they have revolutionized their process of purification, having adopted a method which greatly decreases the cost of that purification, and increases the volume of the gas, but which reduces its illuminating power by 11 per cent., and makes it utterly unfit for use in dwelling-houses, by leaving it contaminated with those sulphur compounds which, on combustion, impregnate the surrounding air with stifling fumes of sulphurous acid. Thus an improvement which reduces the cost of production, but seriously deteriorates the quality of the gas, has been universally adopted,

whilst inventions which have had for their object the improvement of the quality of the gas as delivered to consumers, but which have offered no advantage to the producer, have been, without exception, utterly ignored. I do not enter into the subject of price, though something might be said on this head, because, in a wealthy city like this, cost is, with most consumers, a secondary consideration. The man who spends thousands in furnishing his mansion has a right to expect, in the present state of science and manufactures, that his house shall be lighted with a material that shall not damage and destroy the works of art and the things of beauty with which he surrounds himself. He has, I conceive, a right to demand that, in this respect, he shall not be treated worse than the inhabitants of second or third rate towns. He is willing to pay any fair price for such an article, since, if the present price were doubled, it would still be far cheaper than that of any other illuminating agent; but he must have good quality, for without it this grand invention of the century is lost to him. Let the metropolitan companies see to this in a liberal spirit, and let the consumers understand that low-priced gas is not necessarily cheap gas, and then we shall soon, I hope, have a gas of not less illuminating power than twenty candles per five cubic feet per hour, below which quality no gas is fit for domestic use.”

ICE-MAKING MACHINE.—Messrs. Flower and Sons, brewers, Stratford-on-Avon, have for several years used ice for preserving yeast and for other brewing purposes. They have now, after a long series of trials, succeeded in applying Kirk's patent ice-making machine (described in this *Journal*, October 7, 1864). The machine they have in use is capable of producing three tons of ice in twenty-four hours; and it can also be employed in cooling beer direct, by passing cold brine instead of spring water through the refrigerators.

Commerce.

IMPORTS AND EXPORTS OF FRANCE.—The Customs returns for the first five months of the present year exhibit extraordinary changes in the commerce of the country. The imports of cereals and other alimentary matters caused by the badness of crops amount to 93,000,000 of francs more than in the same months of last year, while the exports show a diminution of 198,000,000 of francs (£7,920,000). This great deficit is made up of the following items:—Diminution of 116,000,000 on agricultural produce; of nearly 72,000,000 on miscellaneous matters; of 40,000,000 on silks; of 11,000,000 on woollens; 6,000,000 on made-up clothing; between 3 to 4,000,000 on articles of fashion; 4,000,000 on cotton goods; and 3,000,000 on metal work. The totals for the five months are given as follows:—

	Francs.
Importation	1,303,000,000
Exportation	1,293,000,000
Difference	10,000,000

During the same five months last year the exports exceeded the imports by the sum of 322,000,000 francs.

Colonies.

QUEENSLAND COTTON.—A Brisbane paper says that it is expected that this year cotton will prove a large feature in the exports of this colony. Last year the exports were 196,698 lbs. clean, and 10,568 lbs. unginced cotton, and this year the crop promises to reach up to 3,000 bales, or about three times that of last year. The crop generally is heavy and of good quality. The average of green seed sowing promises about 300 lbs. of clean cotton to the acre.

IRON MANUFACTURE IN AUSTRALIA.—The question of the manufacture of iron is now occupying considerable attention in South Australia, the iron ores of this colony being unbounded in quantity, lying close to the surface of the ground, and of extraordinary richness, some of them 90 per cent. The difficulty is want of coal, but there are inexhaustible forests of wood for smelting, and even if coal had to be imported from New South Wales the extreme richness of the ores would doubtless more than make amends for the extra cost of fuel.

Notes.

AERONAUTICAL SOCIETY OF GREAT BRITAIN.—On Monday, the 15th inst., a meeting of the members of the Aeronautical Society was held in the great room of the Society of Arts; his Grace the Duke of Argyll in the chair. Dr. Wm. Smyth, L.R.C.P., read a paper upon some experiments he had made upon the powers of flight of birds. He found that the wing of a strong pigeon strikes the air with a force which will raise a pound weight one foot high in a minute. But directly the stroke has produced its greatest mechanical effect, it is suddenly cut short, nerves in the wing of the bird letting it know when the maximum effect is attained. He succeeded in cutting some of the nerves of the bird from the organs of motion, the result being that, although the bird flapped the air harder than before, it could not fly. He thought, therefore, that in attempting flight by means of artificial wings, the stroke must be cut short when it has attained its maximum. On these principles he proposed a machine with artificial wings, propelled by motive power obtained from the explosion of mixed oxygen and hydrogen gases. The heat thus produced is not great, and the gases would be exploded in indiarubber accordian-shaped vessels, and these by their expansion would give the stroke. Major J. Scott Phillips proposed a machine with large flat planes before and behind, which would lie in an inclined plane when flying, so as to heap up before and beneath the machine a pressure of air equal to its own weight. It had hoof-shaped wings, propelled by a steam-engine. A paper by Mr. F. Bourne described a little model which raised itself in the air by screws. Mr. Henri Reda St. Martin, a Corsican, exhibited a model machine, made on the principle of a kite, the pull of the string being supplanted by the hold on the air obtained by means of screws. Mr. W. Sadd exhibited a model raised by horizontal cylindrical balloons, and propelled by a screw. Mr. F. W. Breary read a paper by Mr. Artingstall. A few remarks were made by Messrs. F. H. Wenham, C.E., Mackie, Young, H. Bright, and others, and the meeting closed.

CHANGE IN THE CAB SYSTEM OF PARIS.—The Municipal Council of Paris has, it is said, come to the determination to adopt mileage rates in place of the present course system. The new tariff announced is as follows: For a vehicle carrying two persons—85 centimes for the first kilometre; 25 centimes for each kilometre after. For one carrying four persons—90 centimes the first kilometre; 30 centimes each kilometre beyond. A kilometre being roughly five-eighths of a mile, and 90 centimes rather less than nine pence, the latter rate will be equivalent to about seven pence for the first half mile, and less than three pence for each succeeding half mile. The difference between the price of the two and four horse vehicle is so trifling as to be almost nominal. The present system is certainly unjust to all parties. To pay for a very short course fifteen or eighteen pence, according as the cab has seats for two or three, with a gratuity to the driver, is certainly too high, while a course from one extremity of Paris to the other is certainly too long for the same money; but to carry the new plan into successful operation it is held here that a meter is absolutely necessary to settle the question of distance, and although

an immense number of instruments have been produced for the purpose in Paris, it was the opinion of the municipal authorities a very short time ago that none of the meters submitted for trial were entirely satisfactory. It is to be hoped that the resolution of the Council alluded to indicates the production of a suitable instrument.

Correspondence.

INDUSTRIAL EDUCATION AND THE PARIS EXHIBITION.—SIR,—I have just read in the *Engineer* of 12th July a paper written by Mr. James Kitson, junior, and produced at the annual meeting of the Yorkshire Union of Mechanics' Institutes, which I recommend you to re-print, as being a fair and suggestive comparison between the relative positions of the United Kingdom and foreign countries in the competition for industrial supremacy. It is as follows:—

"The question of industrial education has been raised in a letter recently published in the *Times* by Dr. Lyon Playfair, and our president has directed the attention of several of our friends to it, who will probably shortly address you; to confine the discussion I will, therefore, content myself at the present moment by considering the remarks and proposals of Dr. Playfair, though it is a topic which might be advantageously examined in a more extended manner. I will first reply to the statement made by Dr. Lyon Playfair, that a singular accordance of opinion prevailed, that our country (England) had shown little inventiveness, and had made but little progress in the peaceful arts of industry since 1862. This is a very bold and a very disparaging statement, and is so derogatory to our country that it is desirable to examine into the grounds on which it is based, and to see whether it is not rather an opinion founded on limited or deficient information, than one which is a true representation of the progress of arts and manufactures in our country. In the first place, it is incorrect to judge of the manufacturing excellences and the power of production of England from the objects and collections at the Exhibition. France has exposed the products of her manufactures at her own doors, and, what is of more importance to her, in her own market. England has had to transport her articles across the sea, at a much greater cost, and to a market which is to a great extent closed to her. France has in manufactures as well as in war a great idea of glory; England has in trade little idea of glory, but a great idea of doing what will pay. The French have an opportunity of gaining both glory and profit, and hence have been induced to make great efforts to appear well at their universal Exhibition. It is important to bear this in mind, and if we attempt to compare the industrial progress of France with that of England, we must remember that France has shown the choicest products of her manufactures, while we have much at home superior which it has not been thought advantageous to represent at Paris. The great houses of France have spent enormous sums of money on their displays, which no English firm would have been justified in spending. Indeed, it is said that some of the foreign exhibitors have received subventions from their States, while English exhibitors have had to defray the whole of their own expenses. It is true our Government has voted some £200,000 towards the English sectional expenses, but I fear that this sum will not fertilise the pockets of the English exhibitors, as it appears already to have been absorbed by the commission appointed by the mysterious and despotic powers at South Kensington. I would instance, as exhibitions which have produced the feeling of depression on the minds of many of our jurors and writers, the pavilion of Le Creusot. It is a remarkable and a beautiful exhibition, and most beautiful as showing the power and immense capacity of a single establishment, but there is nothing in it which we do not produce in England of in

most points superior quality, and certainly of superior design. The locomotive engines made for an English railway, for which Mr. Schneider obtains great praise, are from English designs, and their construction has been controlled by an English inspector, who has gone direct there immediately after controlling similar works in the best English workshops. Mr. Schneider exhibits three locomotive engines in his own pavilion—the whole of England sends but five; but it would be very erroneous to judge from this the comparative powers of the two countries. I think I have said sufficient to warrant me in asserting that there is a very deficient representation of English manufactures, and, therefore, those who would compare the industry of this country with that of foreign nations must carry their inquiries very much beyond the boundaries of the Paris Exhibition. In my observations as to the position of England in the Exhibition, I naturally prefer to confine myself to those departments with the products of which I have a practical acquaintance; in these I am fortified by having similar opinions expressed to me by men of greater experience, but I have no hesitation in affirming in all the different branches of trade connected with mechanical science we still stand without superiors. I will mention some of these in detail. In marine engines our makers are superior to any of the Continent, both in finish and design. The English marine engines are gems of mechanical finish. In locomotive engines we have the best specimens in the Exhibition; they are equalled in finish of work by one or two foreign engines, but are unequalled in beauty of form and simplicity, and appropriateness of construction. In machinery for working iron and other metals we have no equals. Our makers show the best quality of work, the most mechanical ingenuity and the greatest beauty of form and outline. The best foreign machine tools are copies of English designs, and the engines whose work nearest approaches the English excellence of finish have been made for the most part with tools constructed in the manufactories of Leeds and Manchester. In iron we exhibit in very small quantities samples of unequalled quality, but only the makers of iron of special quality are represented. The great houses who make iron most in demand for the general purposes of commerce are not represented, and for the simple reason that it would not pay them to exhibit. France has high duties on manufactured iron, which close her markets to English produce, and therefore there is no inducement to England to show samples of wares for which she has no market there. The *tours de force*, as samples of skill and power, exhibited by various Continental ironworks, are very remarkable, and exhibit an extraordinary advance in this branch of French industry. Enormous plates, bars of great length and large sectional area are to be seen in great abundance, but are only interesting as showing what can be done, and that any demands of the engineering profession can be satisfied. These heavy plates are not as large as are rolled in England, and all their bars can be as well obtained from English makers if such be required. The material shown by our War Department, by Sir Wm. Armstrong, by the Whitworth Company, is incontestably superior in finish to any other exhibited; all the products of these manufactories are remarkably beautiful, and in advance of those of any nation. I have ventured to give you these specific references to sections of our manufactures, because it is more valuable to give a few positive examples of my view of our position than to make general statements, and also because I think they are sufficient to confute the assertion that we have been surpassed in mechanical science, and to show you that if pre-eminence has been denied us, it has been denied us by those who have not had sufficient information on which to ground their judgment. In the fine arts and in manufactures where the fine arts are most directly applied, I am rather diffident in expressing an opinion, but I have seen specimens of engraved glass, designed by

Englishmen and executed by English workmen, which are unequalled by any country exhibiting. On this point it is interesting—indeed, almost amusing—to read an extract from the *Journal des Débats*, which, as you know, is one of the leading papers of France, in which the writer takes almost the same view of his own country that Dr. Lyon Playfair does of England, and endeavours to read to his country the same warning lesson that we have had from Dr. Playfair:—"A manufactory at Vienna sends some table services that are strikingly elegant in form, and though of crystal they are almost as light as Venetian glass. They are also comparatively cheap, which is an advantage that deserves to be noted. Cheapness is the principal merit of the crystal objects from Belgium that we have examined; but it is not so of those that come from England. The latter are perhaps less pure and less graceful in form than ours, but in the engraving they are admirable. Englishmen are rich and can afford to pay for fine things. They take away our most skilful workmen, and, in addition, are willing to make any sacrifice in order to extend instruction and education, and to improve the taste of their own operatives. During the last twelve years they have made enormous progress in every branch of industry to which art belongs. We Frenchmen must take care that one of these days we do not lose that artistic superiority in which our artisans have taken a lawful pride. Let us multiply our schools for adults; let us employ every effort to enable our workmen to have easy access to those admirable works in which engraving has produced the masterpieces of art in every epoch; if possible, let us open for them collections of objects of art, in every style, in the localities where they live. Let us be upon our guard. Our rivals have arrived very nearly equal to us, and we must take care not to have to say one day that they have surpassed us." Having said thus much in defence of my country, I am free to admit that continental nations have made giant strides in industry, and have relatively made greater progress in manufactures than we have. They had scarcely started a few years ago, while we had advanced to a very high position; and now they have attained to considerable excellence while we have contented ourselves in increasing the quantity of our manufactures, and in the profits of trade unparalleled in extent, and enlarging constantly in an increasing ratio. If continental nations have made these great advances which we admit in the space of a very few years, it is important for us to examine the causes which have favoured it, and to endeavour, if possible, to gather and use the experience of our neighbours. The nations which have made the most marked advances are France, Prussia, and Belgium, and as the same causes have been at work in all these countries, for the sake of brevity I will at the present time confine my remarks to the case of France. Seeing that the natural advantages of France as an iron producing country are inferior to ours, that it is deficient in mineral, which is consequently a drawback to all its manufactures, we can but come to the conclusion that the intelligence which has created and fostered the manufactures which have produced the brilliant displays set forth in the Exhibition, must be of a very high order. It has been my fortune during the past week to meet with several of the first engineers of France, and from them I learn the remarkable fact, that almost without exception, the chief engineers of the railways, of the Government department of the Ponts-et-Chaussées, and the heads of many of the large manufactories, had been pupils of the Central School of Arts and Manufactures, while most of the managers and foremen of works, engineering establishments, and factories have been pupils of the *Ecole des Arts-et-Metiers*. There are few exceptions to these; the rough and ready self-educated men rarely rise above those who have been educated at these schools, because they start the race of life under too serious a disadvantage. I cannot learn that their artisan population are better educated than ours; they are brought up under much the same conditions as ours, and

after attending their communal schools are set to work at an early age. In support of this view of the similarity of education in the two countries, I may mention that it was found that an average number of 300 conscripts in 1,000 in the year 1866 were unable to read; and in 1864 only 239 in 1,000 recruits in England were unable to read; the advantage is therefore on the side of England, more particularly when you bear in mind the class from which our recruits are taken, and that in France the conscripts are taken by lot from the whole population. If we find these pupils of particular schools monopolising the direction of the whole of the manufacturing industries of France, we cannot but acknowledge the merit the schools must possess; and also we could not bring forward a better example of the immense value of education, and can form from this fact some idea of what results we might be able to obtain if the moral and intellectual education of our whole people were as well cared for as the scientific education of a small portion of the French nation appears to be. The Central School of Arts and Manufactures is specially designed to form engineers for all branches of industry, and for public works. Diplomas of Engineer of Arts and Manufactures are given by the Minister of State to those who pass in the first class, and certificates of capacity to those who pass in the second class. Foreigners are admitted as well as natives, and the course is for a period of three years, commencing at seventeen years. The course costs £32 per year, but in certain cases the State will grant a subvention to needy scholars. The Ecole Centrale trains principally engineers who enter the higher grades of the profession, to which their diploma gives them an acknowledged certificate of competency. The Ecole des Arts-et-Metiers has three schools established at Aix, Angers, and Chalons-sur-Marne, which are designed to form chiefs of workshops and workmen instructed for industries where iron and wood are worked. Every pupil must pass an examination, and must be from fourteen to sixteen years old. Only resident scholars are received, who pay £20 a year. The course is for three years, and the instruction is practical as well as theoretic. The theoretic instruction comprises arithmetic, elementary algebra, trigonometry, geometry, mechanics, drawing, and grammar. The practical instruction is given in four workshops of models and carpentry, casting, smiths' works, and mechanical construction. Scholars arrived at the end of their studies receive a certificate, and a silver medal is granted to those who show an exceptional merit. The Conservatoire des Arts-et-Metiers, where public gratuitous lectures on scientific subjects are given, is also a valuable institution to which we have no parallel in England. Here are kept models of all inventions; in the museum are 7,000 models of mechanical appliances, and in the library are 18,000 volumes on scientific subjects, accessible without difficulty to any seeker of knowledge. By these institutions all the known information on scientific subjects is imparted to the students. Every new invention and new mechanical appliance is recorded and made known. The scholar is taught how to apply his classical and mathematical education to the calling which he is to follow, instead of being left, as in England, to gather his knowledge in the uncertain school of practical work. The student is thus started at a much more advanced point than he is in England, where we have no regular scientific schools, and is saved much weary plodding and stumbling through inquiries which have been worked out for him long ago. Our English school of practice has produced many glorious men, but how much weary work and wasteful toil might have been saved them if some such sources of information of the accomplished labours of the past had been opened to them. The work to be done in England in my opinion is, in the first instance, the education of the upper working and the middle class, a work which I think is above the power of Mechanics' Institutions and so-called departments of science and art. It is a question which is worthy of the earnest attention of Government, who

are as much bound to interest themselves in the industrial education of the country as they are to regulate the education of the surgeon or physician for the prosperity of the country, and hence the material comfort and well-being of the population, without which you can have no true moral advancement, depends on the measure of success you obtain in your industrial pursuits. As far as the powers of Mechanics' Institutes can be developed, they should be exercised in the scientific education of the working classes of this country; and special attention should be given to the forming of some organisation by which this education can be made more efficient. Although I have stated that the working class of this country is as well educated as that of France, it is not so in Prussia, where, in some degree, education is universal. But in France they are fully alive to the advantage of educating the labouring population, and are making great efforts in this direction. At Creusot Mr. Schneider has established schools under most able management, where, out of a total population of 23,000, there are 4,065 children in regular attendance at school. If we do not bestir ourselves earnestly we shall soon see our working population surpassed in superior education, as at present we see we are surpassed in higher education by the engineers and managers of the great industries of France. There is little doubt that England can still hold the first place at the head of manufacturing industry if she will only make use of the advantages she possesses. Our engineers must have the facilities for acquiring special knowledge which are attainable in other countries, and our people must have the education which will enable them to turn to the best advantage the directions of those whose province it is to guide them. With mineral resources unequalled and unbounded, with a climate the most congenial in the world, and a freedom of government which allows to every man the reasonable hope of attaining any position to which his talents and industry may entitle him—the countrymen of Shakespeare and Watt and Stephenson, if afforded the same advantages of education as are given to those nations which compete with them, can never fail to lead in the industrial advancement of the world."

There is only one statement I wish to correct. The Government has not voted "some £200,000 towards the English sectional expenses," but Parliament has voted £67,000 as part of a total estimated expenditure of £116,600—which I believe will not be reached—and by far the greater part of this sum is to defray expenses which have hitherto been borne by English or French Commissions inviting foreign countries to compete.—I am, &c., HENRY COLE.

Paris, 15th July, 1867.

PARLIAMENTARY REPORTS.

SESSIONAL-PRINTED PAPERS.

- Par. Numb. *Delivered on 11th July, 1867.*
- 234. Bill—Galashiels Jurisdiction.
 - 236. " Factory Acts Extension (amended).
 - 237. " Representation of the People (amended).
 - 243. " Carriers Act Amendment.
 - 329. Limited Liability Acts—Report and Evidence.
 - 405. Mail Services (India and Australia)—Further Correspondence.
 - 417. Vessels—Return.
 - Jews (Moldavia)—Further Correspondence.
- Delivered on 12th July, 1867.*
- 240. Bill—Master and Servant (amended).
 - 241. " District Prothonotaries, Court of Common Pleas, County Palatine of Lancaster.
 - 244. " Local Government Supplemental (No. 6).
 - 245. " Justices of the Peace Disqualification Removal.
 - 391. Army (Snider Rifle)—Reports.
 - 422. Constabulary (Ireland)—Statement.
 - 423. Quarantine—Return.
 - Revised Code (Scotland)—Minute.
 - Standard Weights and Measures Department—First Report.
 - Schools Inquiry Commission—Report.

Delivered on 13th July, 1867.

242. Bill—District Lunatic Asylums' Officers (Ireland).
 247. " Parliamentary Elections (amended).
 338. East India (The Deccan)—Treaties and Engagements.
 421. Rangoon—Letter.
 Gold Coast of Africa—Convention.
 Education—Report and Appendix.
 Public Petitions—Thirty-third Report.

SECOND DELIVERY.

250. Bill—Representation of the People (amended on consideration).

Delivered on 15th July, 1867.

248. Bill—Courts of Law Officers (Ireland) (amended on re-commitment).
 242. (1.) Merchant Shipping Tribunals (Supplementary Return)—Memorials, &c.
 429. Factory Acts Extension and Hours of Labour Regulation Bills—Special Report.
 432. Parliamentary Deposits—First Report.
 435. Workhouse Dietaries—Papers.
 Ship "Mermaid"—Correspondence.

Delivered on 16th July, 1867.

249. Bill—Metropolis Subways (amended).
 362. Universal Art Catalogue—Correspondence.
 Customs—Eleventh Report of the Commissioners.

Patents.*From Commissioners of Patents' Journal, July 19th.*

GRANTS OF PROVISIONAL PROTECTION.

- Bedsteads, couches, &c.—1884—W. Marshall.
 Bench hooks—1918—F. T. Pollard.
 Blankets used in machines for printing textile fabrics—1889—E. J. Hughes.
 Boilers—2009—J. Credland.
 Bottle holders—1885—C. Toft.
 Bottle stoppers—869—A. S. Stocker.
 Bottle stoppers—1921—W. Dues.
 Bronzing machine—1788—L. Simon.
 Brooch fastenings—685—J. J. Blackham.
 Butter, preserving—1942—J. H. Johnson.
 Buttons—1929—T. Young.
 Carbon, apparatus for making sulphuret of—1886—C. O. Heyl.
 Carriage bodies, pleasure boats, &c.—1903—H. J. Cox.
 Casks, appliance for filling, &c.—1935—J. McKibbin.
 Centrifugal governors—1936—H. and D. Davey.
 Charcoal, &c., preparing—1983—W. Harris.
 Chronographs—1957—A. A. Champion.
 Cigars, &c., mouthpieces for—1945—W. Thompson.
 Clocks—1915—J. G. N. Alleyne.
 Coal, &c., machinery for getting—1927—J. Sturgeon.
 Combs for warping, &c.—1909—J. Conlong.
 Cotton waste, &c., extracting fatty matter from—1897—C. O. Heyl.
 Croquet balls, &c., stands for—1960—J. Bolton.
 Door handles—1902—A. Hodge.
 Electric telegraphic machines—1917—F. T. Hubert and H. D. G. Truscott.
 Engines and pumps, rotary—1984—W. Archer.
 Engines, jacquard—1895—J. and T. Anderson.
 Envelopes—1882—W. Davis.
 Fabrics, fixing metals on—1913—C. E. Brooman.
 Fabrics, ornamental textile—1807—W. Clarke.
 Fabrics, textile—1906—A. Stewart.
 Fabrics, &c., printing—1975—F. Andrew and L. Clarkson.
 Fibrous materials, manufacturing cards for combing—2013—W. R. Lake.
 Fibrous materials, opening and cleaning—1923—J. Greenhalgh.
 Fire-arms, breech-loading—1904—S. E., and W. Trulock.
 Fire-arms, breech-loading—1926—A. M. Clark.
 Fire-arms, breech-loading—1932—W. E. Newton.
 Fire-arms, breech-loading—1971—J. MacNaughton.
 Fire-arms, &c.—1934—F. R. Aikman.
 Furnaces—1955—T. and T. Vicars and J. Smith.
 Furnaces—1980—T. Morgan.
 Gas, manufacture and purification of—1931—J. Somerville and R. Elsdon.
 Grain, cleaning—1997—A. Mather.
 Grape vines, &c., training—1991—J. G. Tongue.
 Hammers, steam—1944—D. Davy.
 Hooks, spring—1746—T. Walker.
 Hydrocarbon liquids, utilisation of waste material obtained in the manufacture of—1888—J. C. Sellars.
 Ice-making apparatus—1939—J. Whitford.
 Iron and steel, manufacturing—1905—W. H. Richardson.
 Jupons—1874—C. E. Brooman.
 Jute, treating—1901—A. M. Fell.
 Lamp and match box combined—1947—F. Leonardt.
 Lamps for burning petroleum, &c.—1910—C. Petit.
 Levels—2005—W. E. Gedge.
 Looms—1870—J. Gabbott.
 Looms—2017—H. English and J. Farndon.
 Lubricating compound—1950—A. E. Herrmann.
 Lubricators—1928—A. Schwartz.
 Machinery, twisting or doubling—1896—J. Holroyd & W. Fieldhouse.
 Metal sheathing for ships, &c.—1961—W. Day.

- Motive-power engines—1892—C. Brown.
 Motive-power engines—1941—R. Shaw.
 Mowing machines—1995—J. Shanks.
 Needle cases—2007—W. Avery.
 Paper ruling machines—1946—J. Salmon and G. W. Hick.
 Presses for cutting paper—1920—J. R. Burn.
 Presses for stamping or endorsing—1890—A. M. Clark.
 Pumps—1898—P. Zaroubine.
 Railway switches and signals, apparatus for working—1959—F. Brady.
 Railway trains, communicating intelligence between parts of—1878—C. J. Pownall.
 Railways—1979—W. E. Newton.
 Scarfs, &c.—1964—I. Pick.
 Sheep, &c., purifying compounds for fleeces of—1900—A. M. Fell.
 Ships' propeller and steerer—1963—A. V. Newton.
 Ships, propelling—1958—H. Clarke.
 Ships, &c., composition for preventing the fouling of the bottoms of—1924—G. A. F. Fowke.
 Shutters, revolving—1953—T. Welton.
 Signals—1993—J. Johnson, E. Shinn, and G. Ragg.
 Skirts, ladies'—1893—H. A. Lyman.
 Soap, gauging and cutting—1866—E. Whele.
 Soda water, &c., manufacture of—1949—W. E. Newton.
 Steam engines—1966—H. Ruddick.
 Steam engines—1974—W. C. Church.
 Straps, elastic—1970—C. D. Abel.
 Tapers, making—1907—J. J. Lane.
 Telegraphic apparatus—2015—W. S. Andrews.
 Tobacco pipes—1977—R. Tiernan.
 Traction engines—1999—N. Clayton and J. Shuttleworth.
 Tubes, connecting, &c.—1987—N. Thompson.
 Tubes, metal—1973—W. R. Lake.
 Tubes, welded—1937—W. Galloway and G. Plant.
 Tuyeres for smiths' hearths—1876—M. H. Taylor.
 Tyres for railway wheels—1981—H. B. Woodcock.
 Umbrellas, apparatus for carrying—1951—E. M. Brown.
 Valves—1940—W. S. Scott and W. H. Steel.
 Valves—2001—N. Clayton and J. Shuttleworth.
 Venetian blinds—1919—P. Ironside.
 Vessels, propelling—1943—H. Clarke.
 Washing, &c., machines—1963—E. O. Greening and J. Atkinson.
 Water-closet fittings—1978—T. C. Thomas.
 Wells, apparatus for sinking—1916—J. Chaudron.
 Wire netting, folding—1891—G. K. Geyelin.
 Wrenches—1894—J. G. Tongue.
 Yarns, &c., printing—1925—P. and J. Wood.

INVENTIONS WITH COMPLETE SPECIFICATIONS FILED.

- Boots and shoes—2035—J. H. Johnson.
 Mines, raising and lowering persons, &c., in—2044—E. H. Bernier.
 Pulley and chain gearing—2073—T. Wrigley.
 Railways—2089—H. A. Bonneville.

PATENTS SEALED.

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|---|---|
| 147. R. Harlow. | 196. W. Gray. |
| 150. W. E. Gedge. | 205. S. Carey. |
| 152. J. Rowley. | 211. J. J. Lundy. |
| 151. J. Edwards. | 290. J. G. Robinson. |
| 163. J. Northrop and S. and W. H. Tetley. | 398. W. Clissold. |
| 168. C. Coleman. | 440. R. Thwaites, E. H. Carbutt, and J. Sturgeon. |
| 174. T. Ross. | 1150. J. Millward. |
| 194. F. H. McLaughlan. | 1404. J. Watkins. |

From Commissioners of Patents' Journal, July 23rd.

PATENTS SEALED.

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| 178. F. Palmer. | 244. W. E. Newton. |
| 180. T. Taylor. | 254. B. Hunt. |
| 181. C. E. Brooman. | 255. B. Hunt. |
| 186. G. B. Woodruff. | 267. J. H. Johnson. |
| 200. J. Clark. | 271. D. A. Halket. |
| 203. H. Boys. | 307. J. F. Philippi. |
| 208. P. Jensen. | 331. C. E. Brooman. |
| 209. M. H. Lishman and E. Chambers. | 362. J. H. Johnson. |
| 216. J. Taylor. | 396. A. V. Newton. |
| 219. G. Haseltine. | 405. S. D. Mack. |
| 221. E. H. Waldenstrom and I. G. Bass. | 540. T. Humphreys. |
| 223. G. Haseltine. | 1012. S. Perkins. |
| | 1181. A. V. Newton. |
| | 1366. S. W. Worssam. |

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

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| 1778. J. Chalmers. | 1804. H. E. F. De Briou. |
| 1797. P. G. B. Westmacott. | 1812. J. Coton. |
| 1807. G. P. Harding. | 1855. T. Dixon. |
| 1822. N. Salamon. | 1809. J. Laubereau. |
| 1799. A. Espirat and E. Sause. | 1811. F. Gregory. |
| 1802. T. Bourne. | 1849. J. Jeffreys. |
| 1813. W. E. Newton. | 1891. A. Wydler. |
| 1873. W. Anderson. | |

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

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| 1750. A. B. Woodcock. | 1769. J. H. Young. |
| 1804. H. C. Ash. | 1795. W. E. Taylor. |
| 1764. C. C. J. Guffroy. | 2015. E. Hall. |
| 1754. J. Saxby. | |